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DEFENCE RESEARCH BOARD CAMPS IN NORTHERN ELLESMERE ISLAND: REPORT ON HISTORICAL RESOURCES

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Figure 1: Bombardier "Ski-doo" train with J-5 sleds, modelled after Baffin Island Inuit komatiks, in tandem. Glacier No. 2 at Hare Fiord, in Northern Ellesmere Island, 17 May 1965. (Photo courtesy of Harold Serson, Brentwood Bay, British Columbia).

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HISTORICAL BACKGROUND

Between 1953 and the mid-1970s the Defence Research Board of the Canadian Department of National Defence (DND) played a leading role in organizing and carrying out a broad range of interdisciplinary scientific studies in northern Ellesmere Island. Formed in 1947 the Defence Research Board (DRB) was assigned general responsibility for scientific research within the Defence department. Its formation coincided with the completion in 1946 of Operation "Muskox," a major overland exercise in arctic transportation, supply, and logistics. O.M. Solandt, the DRB's first chairman, later wrote that the success of "Muskox" convinced Canadian authorities of the need for an active military research program in the Arctic. Such a program would provide the armed forces with first hand experience of "the very demanding situations that are so hard to provide in peace-time training." But beyond defence research considerations, they viewed an integrated program of research activity as a means of asserting effective Canadian presence – hence, sovereignty – in the Arctic.[1]

To address these objectives the DRB organized a series of expeditions to northern Ellesmere Island, beginning with Geoffrey Hattersley-Smith's ice shelf reconnaissance work in the early 1950s. More permanent research facilities were established with the greatly expanded scope of Operation "Hazen," 1957-61, Operation "Tanquary," 1962-70, and a long-term program of ice shelf studies from a base on Ward Hunt Island. Defence research has continued in the region under the auspices of the Defence Research Establishment Pacific of DND, which operated the Tanquary camp from 1976 to 1978. More recently the co-ordination of High Arctic research has been assumed by the Polar Continental Shelf Project of EMR Canada, which has operated the Tanquary base camp since 1978. Collectively, the three research base camps in northern Ellesmere provide important documentation and insights into the history of science, logistics, and transportation in one of Canada's most remote regions.

INTRODUCTION

This report follows from a Canadian Parks Service (CPS) site investigation in July 1989 of the three former Defence Research Board (DRB) base camps in northern Ellesmere Island, located at Lake Hazen, at the head of Tanquary Fiord, and on Ward Hunt Island off the northern coast of Ellesmere (Figure 2). The field work was carried out in response to commitments made in the Interim Management Guidelines (IMGs) of Ellesmere Island National Park Reserve for an assessment of cultural resources at abandoned research camps in the park area, and the IMGs' Heritage Preservation Objectives, which call for the retention of resources tied to the theme of Exploration and Survival in the High Arctic. Part of the impetus for this project was the identification of representative cultural resources to enable the removal of intrusive remains of human activity, in particular the extensive stockpiles of used fuel drums in the region.

Beyond the protection of cultural resources, the IMGs also provide a mandate to interpret and encourage public understanding of such resources within the park reserve, particularly those associated with native cultures, northern exploration, and scientific investigation. Since the IMGs also indicate that CPS will establish a visitor orientation display at Tanquary Fiord, the site work at Tanquary Fiord focused on those DRB artifacts that were considered to have interpretive value in possible future displays. A full list of the artifacts set aside at Tanquary Fiord for possible future retention and interpretation, and annotated in terms of the relevant thematic associations, is provided in the Appendix. With regard to Lake Hazen, the IMGs require that "the existing parcoll unit [meaning the Attwell shelter] will be upgraded to serve as an interim base for warden patrols."[2] Accordingly, the shelter and a number of artifacts at Lake Hazen were also investigated with a view to identifying items of historical interest which might be retained at this site.

The third major DRB camp, on Ward Hunt Island, presently falls outside the boundaries of the park reserve. In view of the island's possible future inclusion within the park reserve, its re-

sources were also considered to merit attention. In addition to the team's field notes and other publications, various source materials were provided by Harold Serson, formerly with Operation "Tanquary" in the 1960s and 1970s, including his 1963 inventory of structures and artifacts at Ward Hunt Island. He accompanied the team to both Ward Hunt Island and Lake Hazen, where he identified a wide range of artifacts, and he also shared access to his photographs and broad knowledge of the Tanquary Fiord camp.

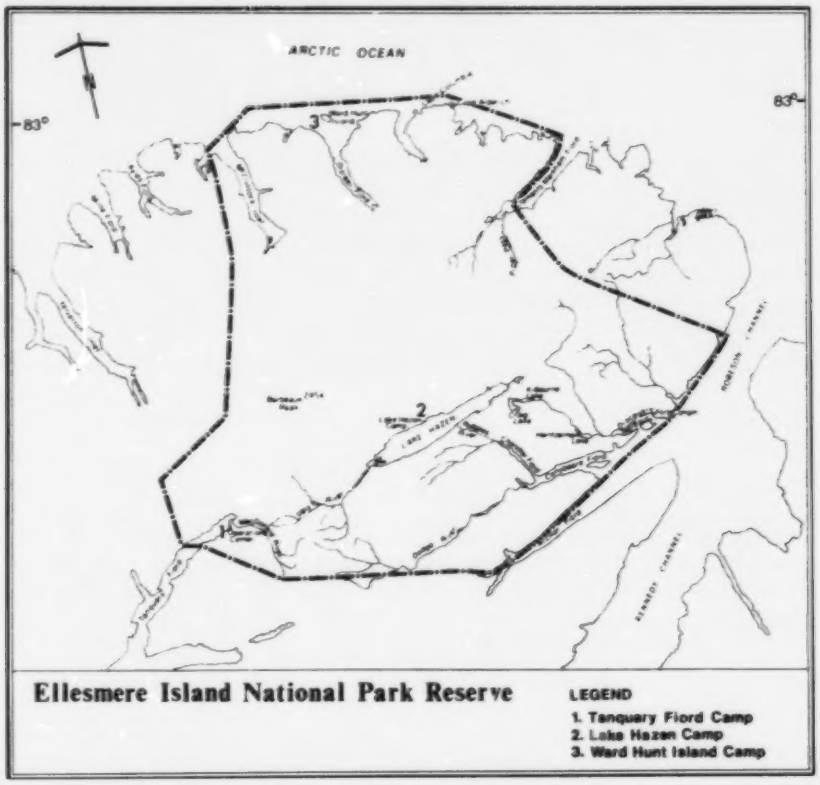

Figure 2: Map of northern Ellesmere Island, showing the DRB camp sites and the boundaries of Ellesmere Island NPR (CPS, PNRO).

LAKE HAZEN DRB CAMP

The Attwell shelter and other cultural resources of the Defence Research Board camp at Lake Hazen are associated with one of the most comprehensive international scientific research undertakings of the 20th century. The International Geophysical Year (IGY), sponsored by the International Council of Scientific Unions and comprising 55 participating nations, was a "concerted effort by more than 5000 scientists to obtain a unified picture of our physical environment."[3] Between July 1957 and December 1958 scientists from 55 nations took simultaneous measurements of such phenomena as "aurora, cosmic rays, meteors, the ionosphere, glaciers, ocean tides and currents, gravity, magnetism, earth tremors, solar flares and sunspots." IGY was the third, and by far the most comprehensive of three international polar research programs be-

ginning with the International Polar Year of 1882-83 and its successor, the Second Polar Year of 1932-33.

In this context the Defence Research Board established its base camp on the north shore of Lake Hazen in 1957. The DRB had already carried out research on the Ward Hunt Ice Shelf off the northern Ellesmere coast in 1953-54 and assumed a general co-ordinating role for the IGY interdisciplinary research undertaken at Hazen. Focusing on glaciological studies, the Hazen IGY operations featured a party of four men, who wintered at the DRB camp, and summer parties totalling 23 men, who operated from either the Hazen base or Gilman subsidiary camps. Among the disciplines represented were glaciology, meteorology, geology, surveying, archaeology, aquatic biology, botany, geophysics and mammalogy.[4] Smaller research projects operated at Lake Hazen and on the Gilman Glacier from 1959 to 1961.

The historical significance of Operation "Hazen" stems from its role as the most comprehensive scientific research project ever carried out in the Canadian High Arctic, apart from its successor Operation "Tanquary," which the DRB mounted in the wake of the Hazen successes. Collectively, the data gathered on plants, birds, mammals, invertebrates, geology, soils and climate has been termed "the most comprehensive information base of any site in the High Arctic."[5] Secondly, the Hazen project was noteworthy for its rather remarkable co-ordination of such a varied combination of interdisciplinary studies in the most remote region of Canada. Operation "Hazen" was the first research project to exploit major advances in the logistics of northern air travel pioneered in the 1950s, including the use of light airplanes and helicopters. The DRB also pioneered in the use of snowmobiles on the Arctic Islands and in the use of "an inexpensive temporary building" (Attwell or Jamesway shelter) as a research laboratory.[6]

While paving the way for subsequent research efforts, the expedition's activities were closely identified with the strategic defence of the North American continent. Moreover, Operation "Hazen" represented a recognition on the part of the Canadian government of the value of investing in scientific exploration as "the cheapest and most effective means of demonstrating Canadian sovereignty" in this most northerly region of Canada.[7] By sending major research parties to Hazen and subsequently to Tanquary, the government was demonstrating a commitment to occupy and manage its northern territories. The existing shelter, early oil drums and other artifacts document these pioneering efforts in northern research, logistics and assertion of a Canadian presence in the arctic islands.

Attwell Shelter

These lightweight, collapsible shelters consisted of an insulated dark green canvas cover stretched over a series of wooden arches, which gave the structures their characteristic pointed arch shape. At one end a plywood framework supported an entrance door with inset window; on the other a similar framework supported a simple single-pane window. The superstructure was erected on a plywood base, measuring 5 m by 7 m. To date research has not turned up specifications on the surviving Attwell shelter. While the interior is in good condition, its faded, torn, and tattered canvas cover is in need of replacement.

The Attwell shelter at Lake Hazen DRB Camp was used earlier when a SHORAN station was set up on Johns Island, only 3 miles (5 km) from the camp in the middle of Lake Hazen. The SHORAN (Short-Range Aid to Navigation) system was developed during the Second World War "as a navigational aid for precise tactical bombing."[8] During Operation "Hazen" the Attwell served as the living quarters of the four young scientists who overwintered at Lake Hazen camp in 1957-58. At this time, a second unheated shelter for stores was assembled and connected to the first although it has since been removed.[9] Views of the Attwell as it appeared in 1959 during Operation "Hazen," and in 1989 are provided in Figures 3 and 4.

At least two other temporary camp buildings were used during Operation "Hazen." These were "Jamesway" shelters, manufactured by the James Manufacturing Company of Jamesville, Wisconsin. Developed as a lightweight portable shelter by the U.S. Army Air Corps, they were

widely used by the American military in Alaska during and after the Second World War.[10] Measuring 10 feet by 16 feet (3.2 m by 5 m) the Jamesway was smaller than the Attwell, and its arched supports were rounded, in contrast with the Attwell's peaked arch shape. The Jamesway shelters used at Hazen camp were covered with white covers as a camouflage in the predominantly snowy conditions of the High Arctic, contrasting with the dark green canvas of the Attwells that was intended to blend in with vegetated environments.

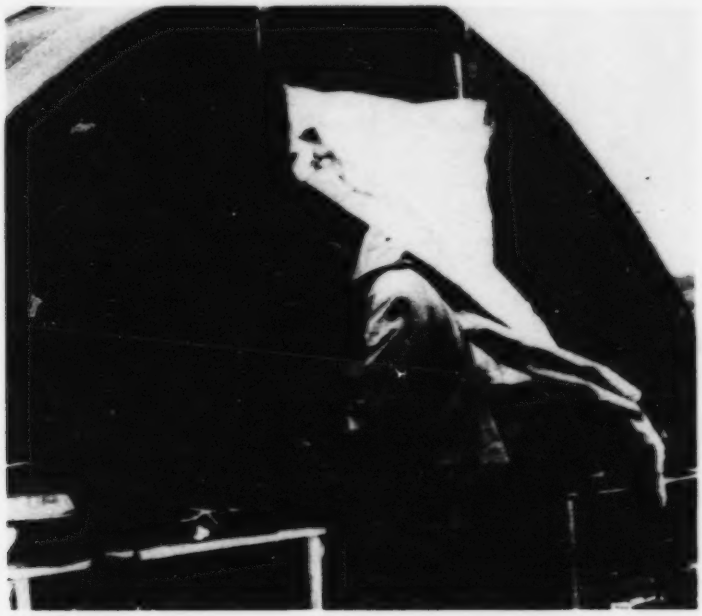

Figure 3: Exterior of the Attwell shelter at Lake Hazen DRB camp in 1959. (Photo courtesy of Dr. John Powell, Edmonton, Alberta).

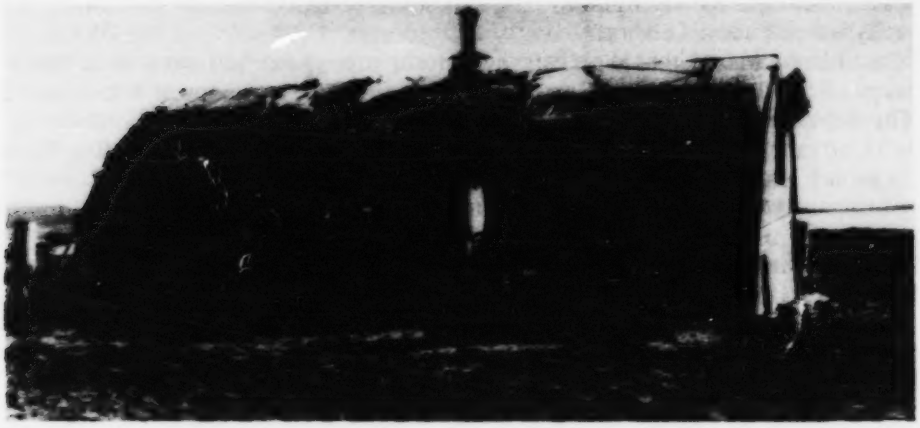

Figure 4: View of the Lake Hazen Attwell shelter, July 1989. Photo from the collection of Historical Services, Canadian Parks Service, Prairie and Northern Region (HS, CPS, PNRO).

Vehicles

A variety of motorized vehicles were used by the members of the Defence Research Board expeditions at the three principal base camps and on fieldwork away from these sites. These ranged from heavy-duty crawler tractors used in grading airstrips and clearing snow, to light-weight motor toboggans used in transporting men and equipment in field work away from the camps.

TD-9 Tractor Bulldozer Blade Frame and Winch

The only heavy tractor used during Operation "Hazen" was an International TD-9 crawler tractor which, along with its bulldozer blade and winch, weighed over 3600 lbs. (8000 kg). The equipment was flown into Hazen in two flights that landed on the lake ice in April 1957. It was used to clear a landing strip on the lake and to haul supplies loaded on the "Northland" sled from the lake to the camp.[11] The tractor was subsequently removed but the winch and the former frame of the bulldozer blade have endured at the Hazen site.

"Eliason" Motor Toboggan

The remains of an "Eliason" motor toboggan have been identified at the Hazen DRB Camp (Figure 5). These vehicles were first used on the Arctic Islands during Operation "Hazen" between 1957 and 1959.[12] Later they were used by the personnel of Operation "Tanquary" in the 1960s. While the artifact at Hazen is an incomplete example, Harold Serson has advised that an "Eliason" toboggan in very good condition still lies at the head of Otto Fiord in northwestern Ellesmere Island about 80 miles (130 km) from Tanquary Fiord base camp. Preliminary discussions with Dr. John Thorleifson of DREP indicate that the Canadian Parks Service could obtain permission to reclaim it if desired for interpretive purposes.

The "Eliason" motor toboggan was first manufactured in Canada by the Four Wheel Drive Auto Company of Kitchener, Ontario, in 1943. It was a single-track vehicle mounted on two skis, whose body of laminated wood and steel measured 90 inches (2.3 m) long, 30 inches (0.8 m) wide and 39 inches (1 m) high, weighed 95 lbs. (209 kg), and was powered by a 9 h.p. engine. Depending on snow conditions its maximum speed was 25 miles (40 km) per hour with towing capacity at 1000 lbs. (450 kg) and fuel consumption of 25 miles (40 km) per gallon.[13]

Experts considered the vehicle's principal advantages to be its ability to negotiate soft snow conditions and its light weight, enabling its use on floating ice where heavier vehicles would be dangerous. The "Eliason's" light weight also made it suitable in terms of high arctic logistics. Not only was it a comparatively light air cargo, it could be lifted without difficulty by four men and thus easily loaded into an aircraft.

A 1958 article indicated that the "Eliason" motor toboggans had been used since 1950 on winter surveys of the Topographical Survey Division of the Department of Mines and Technical Surveys. The department had originally introduced these vehicles as trail breakers to pack the loose snow in advance of the surveyors' dog teams. They were also used during Exercise Sun Dog Two, a joint Canadian Army-Air Force exercise in February 1951, about 85 miles (140 km) northwest of the army's Experimental and Training Station at Fort Churchill, Manitoba.[14]

Bombardier "J-5"

A Bombardier "J-5" tractor was used in vehicular transport around the base camp and in fieldwork in the region. It was an all-purpose vehicle that could be used both for over-land and over-snow travel. G. Hattersley-Smith and J.R. Lotz of Operation Hazen described the "J-5" as "extremely useful in the early stages of the expedition for putting in caches and for hauling the 'Northland' sled," although they noted that it was never used on the Gilman Glacier.[15] The "J-5" used at Lake Hazen was later moved to Lincoln Bay, south of C.F.B. Alert, where it was used in support of ice drift research in Robeson Channel, and as of 1989 was still there in good opera-

ting condition. Another of these vehicles in current use is included among the equipment artifacts at Tanquary Fiord base camp (Figure 9).

Figure 5: "Eliason" motor toboggan at Lake Hazen DRB camp, with fuel drums in the background, and used JATO rocket bottles to the right, 1989 (HS, CPS, PNRO).

"Northland" Sled

A "Northland" sled used during Operation "Hazen" remains on site behind the Attwell shelter at the Lake Hazen DRB camp (Figure 6). Constructed by the Canada Car and Foundry Company of Ottawa, this sled consists of a platform of corrugated wood wrapped with a band of rolled steel and resting on four legs with steel coil-spring suspension, mounted, in turn, on four short ski runners. The sled weighs 1800 lbs. (850 kg) and measures 14 feet by 8 feet by 2 ½ feet (4.5 m by 2.5 m by .6 m).

The "Northland" was originally developed by the DRB after the 1946 Operation "Muskox" demonstrated the need for a strong but comparatively light sled for hauling fuel and other heavy loads behind military over-snow vehicle carriers. The sleds were tested in 1947 in various mobility trials by the Defence Research Board at its principal northern laboratory at Churchill.

The "Northland" was used to transport various loads of equipment supplies and fuel drums from the airstrip on the lake ice to the base camp, and for general haulage around the lake.[16] However, in the opinion of a former DRB technical officer, its deck was poorly designed as it was too high for men to lift heavy items such as fuel drums without great difficulty.[17]

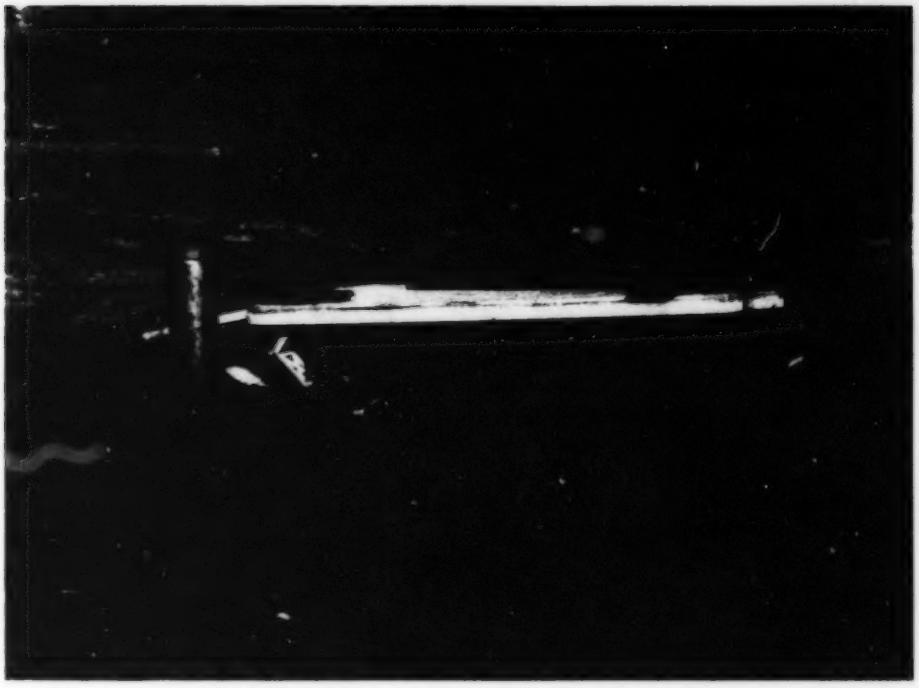

Figure 6: "Northland" sled, Lake Hazen DRB camp (HS, CPS, PNRO).

Battery Chargers

Three battery chargers are currently located beside the Attwell shelter at Lake Hazen DRB camp. The A.P.U. (Air Power Unit) charger was one of the emergency power sources used by the DC3 and C119 airplanes that supplied Operation "Hazen" between 1957 and 1962. These motors were used to charge up the airplane batteries after they landed.[18]

The other, smaller units are commercial off-the-shelf chargers standard throughout North America both before and after the Second World War. They were used to charge a variety of batteries used at the site, particularly the batteries used in the radio communication equipment.

JATO Rocket Bottles

Behind the Hazen fuel drum cache are several used JATO (Jet Assisted Take Off) rocket bottles (Figure 5). These rocket bottles provided additional jet thrust to help get supply planes airborne from curtailed runway surfaces. Specifically, two of the bottles were clamped to the bottom of DC-3 airplanes to provide extra lift when taking off from the Gilman Glacier, where they had landed either to unload supplies at the beginning of the research camp season, or to pick up these materials at the end of the season.[19]

Fuel Drums

Features common to all post-Second World War settlements and base camps in the Canadian High Arctic are the ubiquitous agglomerations of fuel drums. An eyesore to many observers, the

fuel drums nevertheless can be viewed as artifacts representing important trends in the logistics of operations in this polar region.

At Lake Hazen eight fuel drums considered to represent the periods and trends of greatest historical interest were set aside, along with a representative selection of the smaller fuel containers. The larger fuel drums include U.S. Air Force drums painted with the green-coloured stencil of the Thule Air Base in northwestern Greenland, from which the original air supply of Operation "Hazen" was mounted. These drums contained 53 U.S. gallons of fuel (or 45 Imperial gallons or 200 litres). Other drums set aside include two Royal Canadian Air Force barrels, representing the subsequent use of the RCAF in the spring airlift of Operation "Hazen" and, after 1962, of Operation "Tanquary" (Figure 5).

Smaller Fuel Drums and Containers

A selection of smaller fuel containers used at Lake Hazen DRB camp have been set aside for retention as artifacts, including:

i) Jerry Cans. These fuel containers held the equivalent of 5 U.S. gallons (19 litres), and were characterized by a rectangular upright shape with a handle of three parallel bars. The design for these containers was first developed in 1941 by the German military – hence the nick-name "Jerry" – and was copied by the Allied countries after the Second World War. Most of these cans at Hazen camp are green coloured, although a red-painted Jerry can with a spout was used to carry water.[20]

ii) U.S. Army Pails. These green-coloured containers were used by Defence Research Board scientists for packing instruments for field trips.

iii) Oil drum, dated "May 55." This drum was used as a container for lubricating oil.

iv) Naptha Tins. These tins got double duty; in addition to being naptha vessels, they were used by Operation "Hazen" personnel as curling rocks in sporting matches on the lake ice.[21]

Fuel Drum Shelter

In addition to the small number of individual drums selected, it is recommended that the fuel drum shelter just west of the Attwell shelter at Lake Hazen DRB camp be retained as an historical artifact. This shelter was built as a food cache in 1964 or 1965 by Don Oliver of the Department of Agriculture during his research at Lake Hazen. It was originally roofed with a tarpaulin, and functioned to keep wild animals away from the staff's provisions.[22] The food shelter shows an imaginative re-use of available materials and well represents the adaptative strategies necessary to the mounting of successful operations in this remote region.

TANQUARY FIORD DRB CAMP

The Defence Research Board camp at Tanquary Fiord was the focus of Canada's High Arctic defence research between 1962 and 1970. Following the highly successful DRB activities at Lake Hazen between 1957 and 1961, the government responded to the newly demonstrated viability of mounting research operations in this region by shifting its research base to Tanquary. As with Hazen, Tanquary was associated with a variety of interdisciplinary studies, including meteorological, oceanographic, glacial, biological and archaeological research, although sea ice research provided the primary focus for much of the work. The underlying rationale for this research was similar to that for Hazen, that is, to demonstrate the logistical feasability of mounting military as well as scientific operations in Canada's most northerly region.

Tanquary DRB camp was not the first human occupation of the area around the fiord's head. In addition to documented use by the Independence I and II cultures (ca. 4000 and 3000 Before the Present) and the Thule culture (1100-1650 A.D.), Tanquary Fiord was visited intermittently by Euro-North American parties in more recent times. In the early 20th century W.E. Ekblaw, an American geologist and botanist, traversed northern Ellesmere Island twice. Discovering a northeastern arm of Greely Fiord he named it Tanquary Fiord, after Maurice Cole Tanquary, a fellow member of Donald B. MacMillan's expedition of 1913-17 in search of "Crocker Land," the fictional land that Robert E. Peary thought he had sighted from the northern coast of Axel Heiberg Island in 1906. Euro-North American use of the area was not resumed until 1961, when two Geological Survey of Canada scientists carried out field work and established a fuel cache near the mouth of the fiord. The following year a topographical surveyor established another fuel cache in support of a tellurometer traverse of northern Ellesmere.

The Defence Research Board's involvement with Tanquary Fiord also dates from 1962. In that year G. Hattersley-Smith and S.J. Windisch of the DRB reconnoitred the head of the fiord in search of a suitable site for establishment of a DRB field camp the following year. They selected a site on the Macdonald River delta, that afforded both a source of fresh water and sufficient level ground for an airstrip.[23]

The camp's equipment, housing, fuel and provisions were transported to the site in August 1962 by the C.C.G.S. *John A. Macdonald*, which sailed in unusually ice-free conditions. The structures erected during the DRB's period of occupation include a large steel Wonder Building, two smaller parcoll shelters, several disassembled parcolls, and a number of ancillary structures. These include various sheds used for a shower, toilet, generator, storage shed and workshop.

Operation "Tanquary" was somewhat anomalous in that it was a major scientific research project mounted in a period of Department of National Defence withdrawal from arctic commitments. To a significant degree the Tanquary project replaced previous defence initiatives, such as the 408 Reconnaissance Squadron of the RCAF, which had been "alert in observing movements of ice islands, changes in ice conditions and unusual features generally." Perhaps the most important by-product of the Tanquary operation (and its predecessor projects at Hazen and Ward Hunt Island) was the development within the DRB of a nucleus of Arctic specialists. Their detailed knowledge of a broad range of data, not only about Northern Ellesmere, but also about the technologies of staging High Arctic operations, has been of both scientific and military value. By developing an active research group, Canada ensured a useful international exchange of arctic data with other countries, particularly the United States. This information was of importance for the balance of the Cold War when Canada's arctic archipelago was assumed to have major geo-political strategic significance.

Structures

Parcolls

While Operation "Tanquary" commenced only six years after its Hazen counterpart, its different shelters and equipment reflected some improvements and innovations in the intervening period. One of the most obvious changes was the use of parcolls in lieu of the Attwell shelters utilized at Lake Hazen and Ward Hunt Island.

The parcoll is a semi-permanent shelter, similar in design to the Jamesway shelter, but somewhat larger. Unlike the Jamesway's wooden framework, the parcoll consists of a collapsible framework of rounded aluminum arches supporting a stretched insulated fabric cover. As with the Jamesways the parcoll packing crates fold out to form the floor.

Two parcolls in service during Operation "Tanquary" continue to be used by the Polar Continental Shelf Project as shelters for researchers based at the camp during the field season. They remain assembled on the sites they have occupied since 1963. A third parcoll from the former DRB collection is currently assembled on the beach at Tanquary Fiord, although it has been

moved periodically in recent years. Parts for at least one other parcoll remain in three packing crates in the equipment line at Tanquary.

Repair Shop

A frame shop for small repairs and general machinery "dirty" work during Operation "Tanquary" remains near the beach at the base camp (Figure 7). This rudimentary square structure is faced and roofed with plywood, and covered by a canvas to repel water. Metal hardware strips are nailed to the outside walls to support shelves for stacking tools for outdoor use. Its interior consists essentially of steel and plywood shelves fastened to the walls, on which are ranged a variety of tin cans, lubricating vessels and other remnants of shop activity. The door is a simple elliptical piece of plywood on hinges. Beside this shelter is a heavy wooden crib used as a "grease pit" for servicing the tractors.

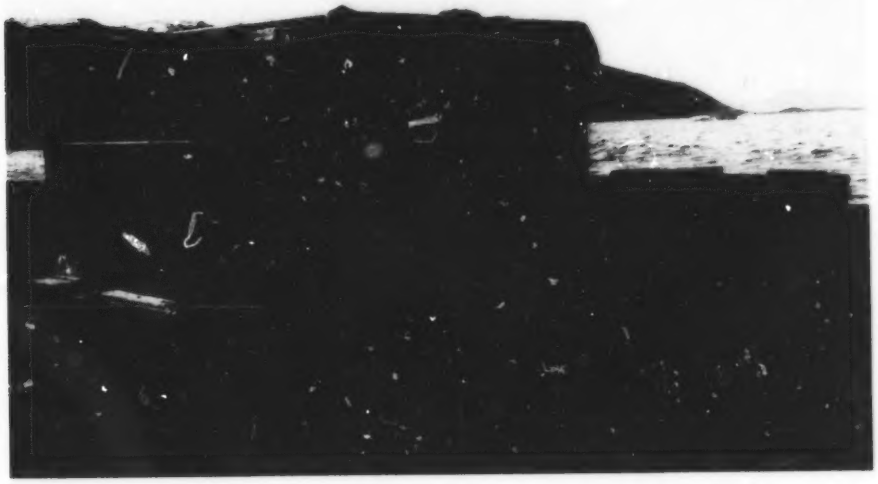

Figure 7: Frame repair shop, Tanquary Fiord DRB camp, 1989 (HS, CPS, PNRO).

Dam

In 1963 Operation "Tanquary" personnel constructed a wooden weir across the mouth of May Creek beside the camp to produce a reservoir for its water supply. This water diversion remains in use today.

Food cache (cold storage)

Adjacent to the dam is a food cache, built into the bank of the stream bed and reinforced by wooden members. The cache represents an adaptive use of the physical environment as its siting obviated the need to build an above-ground, insulated structure.

Equipment

In addition to fixed structures, at Tanquary a large assortment of movable equipment and chattels relate to scientific research, or the historical themes of logistics, transportation and outfitting in the High Arctic.

Instrument Shelter

A collapsible metal instrument shelter used by scientists during Operation "Tanquary" in the 1960s, is presently mounted on an Antarctic Nanson-type sled in the equipment line at Tanquary Fiord (Figure 8). The shelter supports a number of plywood sheets used as flooring and shelves and was evidently designed to fit precisely on top of the sled to facilitate moving instruments and sampling equipment out into the field. A 1965 photograph of the shelter in use in Tanquary Fiord shows it draped in a canvas cover and similarly mounted on an Antarctic sled.[24]

Figure 8: Equipment shelter, Tanquary Fiord DRB camp, 1989 (HS, CPS, PNRO).

Motive Power Sources

Bombardier "J-5"

A Bombardier "J-5" tractor, used during Operation "Tanquary" in the 1960s and 1970s, is still in working order and used as a traction vehicle at Tanquary Fiord. Manufactured at Valcourt, Quebec, these vehicles ran on twin treads and featured an enclosed cab that carried a single driver. In addition to conveying equipment and fuel drums around the base camp, the "J-5" was equipped with a small bulldozer blade for use in clearing the runaway in the first season at Tanquary in 1964 (Figure 9).[25]

Figure 9: John Deere 350 caterpillar grader and Bombardier "J-5" at Tanquary Fiord DRB camp, 1970. (Photo courtesy of Harold Serson).

John Deere 350 Bulldozer

This tractor, still in use today, is a multi-purpose vehicle used both in camp work and in transporting men and equipment in field work over extensive distances (Figure 9).

Bombardier "Ski-doo"

The remains of three Bombardier "Ski-doos" used during Operation "Tanquary" are in Polar Continental Shelf Project's collection of abandoned artifacts at the Tanquary camp. These include two examples currently in the equipment line at Tanquary (Figure 10). First introduced by the Bombadier company of Quebec, the "Ski-doo" was a recent innovation when first brought to Tanquary in 1965. Unlike the "Eliason," which ran on a single tread, the "Ski-doo's" motor-powered twin treads flanked a central steel ski runner.

The "Ski-doo" was the first over-snow vehicle to be produced for a large consumer market. At Tanquary, it replaced the Eliason when it was found to be a superior motor toboggan for field work.

Sledges

Given the ice cap prevailing over much of northern Ellesmere Island and the snow cover present for nine months of the year, the importance of sledges to surface travel is evident. The Defence Research Board employed a variety of sledges for different purposes; some were intended for use in conveying heavy loads such as fuel drums around the base camp, while others were used in the transport of equipment over longer distances.

Figure 10: Bombardier "Ski-doos" at Tanquary Fiord, 1989 (HS, CPS, PNRO).

Greenland Komatik

The Greenland komatik is of ancient origin as it derives from the sledges used by the Thule culture, forerunners of today's Inuit, that flourished in North American circumpolar areas between ca. 900 and 1500 A.D. Komatik design evolved in varied ways in different regions of the High Arctic. For example, the Baffin Island-type sledge of the Canadian Arctic lacked the upright handles that characterized sledges in Greenland. The modern Greenland sledge dates from the importation of lumber by Danish colonists, which enabled the enlargement of the sledge, and the appearance of manufactured iron or steel, suitable for use in constructing runner shoes, which replaced the traditional ivory shoes.

Of simple design the Greenland komatik consists of a pair of runners supporting a deck of cross boards, with buttressed vertical uprights serving as handle bars lashed to the back of the sledge. The rounded runners typically curve upward at the front to facilitate gliding over the snow. Komatiks vary greatly in length, depending on the purpose they are intended to serve. The komatiks used during Operation "Tanquary's" first field season in 1963 were 9 feet (2.75 m) long, compared with 10-foot (3 m) Baffin Island-type komatiks and 12-foot (3.5 m) "Nansen" sleds used on the same expedition. A Greenland komatik from the Tanquary equipment line is shown in Figure 11.

American Second World War military experts considered the Greenland komatiks to be of limited use in very soft snow or in sledging over smooth and level surfaces. However, in sea ice conditions of rough and jagged pressure ridges such as are encountered in the High Arctic, the komatik was viewed as one of the few types capable of withstanding the heavy stress. As well its uprights enabled the driver to manoeuvre the sledge over the ever-present surface obstacles.[26]

In addition to all-purpose use in conveying equipment, the komatiks proved to be suitable mounts for equipment used in field work. For example, during Operation "Tanquary" a "Lucas" hand winch, mounted on its wooden box, was lashed to a Greenland sled. When driven alongside a hole in the ice, the winch was operated while anchored in this position. However, for use

in motor toboggan trains, Hattersley-Smith found the Greenland sleds too short, and recommended the replacement of each of these sleds with two 10-foot (3 m), Baffin Island-type komatiks carrying smaller loads.

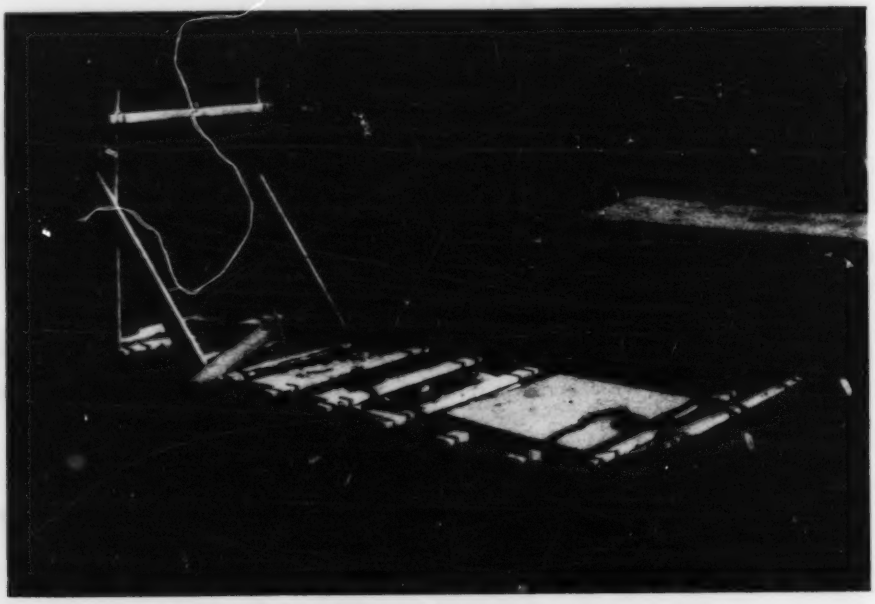

Figure 11: Greenland komatik at Tanquary Fiord, 1989 (HS, CPS, PNRO).

Sledge Dog Traces

Sledge dog teams were used during Operations "Hazen" (1957-58) and Tanquary (1963, 1964, and 1967), as well as the earlier reconnaissances expeditions along the northern Ellesmere Island coast in 1953 and 1954. In the summer of 1957 two teams of 10 dogs were obtained from Qanaq, Greenland, near the Thule air base. Half of a team was kept at the Hazen base camp, and one and a half teams were used for sledging on the glacier. These teams were again used in 1958, along with a new team that was also flown in from Thule.

Some dog traces made from strips of Bearded Seal skin remain in the collection of artifacts at Tanquary. They presumably were purchased from Polar Inuit in Greenland when the DRB rented their sledge dogs for the field season.

Antarctic sledge

Four Antarctic sledges are included among the various types of sledges in the equipment line at Tanquary Fiord DRB Camp (Figure 12). The Antarctic sledge was a modified version of the "Nansen" sled, and was first used in transporting freight during American expeditions to Antarctica. It was one of the lightest sledge-types but its "Czegka" bridge design also enabled it to carry the greatest load in proportion to its weight. Specifically, the Antarctic sledge consisted of a framework of longitudinal slats mounted on a spaced series of bridges, made of hickory, mounted in turn on two hickory runners. Typically, strips of "Bakelite" laminated plastic were glued to the runners to provide a smooth surface.[27] The runners were curved upward at both ends to meet the longitudinal slats.

While designed principally for sledging on the predominantly smooth snow and ice surfaces of Antarctica, American military experts considered that it could easily be adapted to use in the

Arctic. This was accomplished by lashing one cm boards along the undersides of the bridges to protect them against jagged ice, and by tacking steel shoes to the runners. With these modifications the Antarctic sledge was deemed suitable for use on such surfaces as the Greenland ice cap.[28] Obviously it was also suitable for sledging operations on the similar conditions of northern Ellesmere Island.

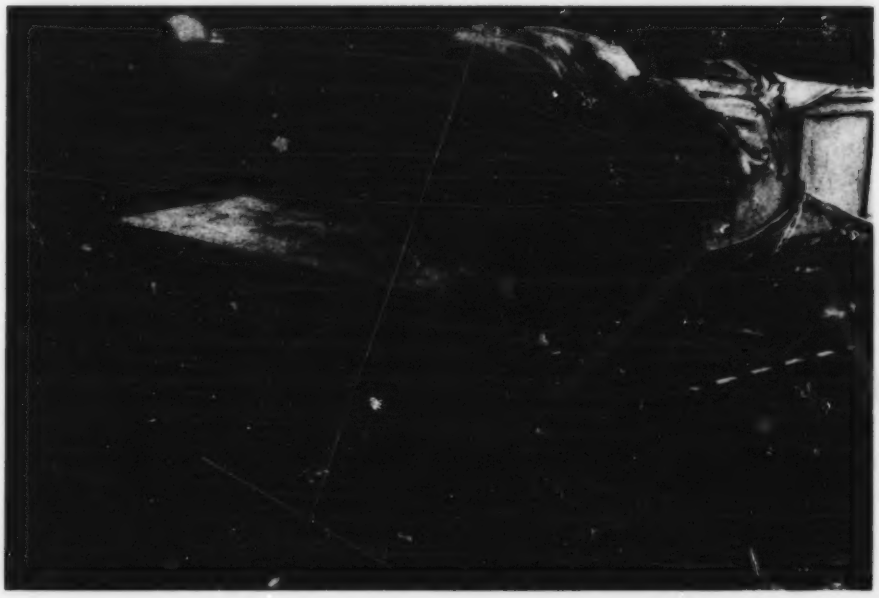

Figure 12: Antarctic or "Nansen"-type sled at Tanquary Fiord, 1989 (HS, CPS, PNRO).

J-5 Sleds

These sleds, which were custom-designed by Harold Serson of Operation "Tanquary" for use in the field in northern Ellesmere Island, were manufactured at the shop at the DRB's laboratory at Shirley's Bay near Ottawa. Designed after Baffin Island komatiks, they consisted of two strong runners shod with strips of rolled steel, spaced by three lengths of aluminium pipe and braced by two diagonal steel cables stretching from the sides of the two end pipes (Figure 13). As with komatiks, a light flexible deck was desired; here it consisted of a plank of ½ inch (1 cm) plywood with paired holes spaced every 12 inches (30 cm) along its outside edges, through which sash cord was used to lash it to the runners, through holes drilled at similar intervals.[29] These sleds were built in two sizes: a large one with a 93 inches by 46½ inches (2.4 m by 1.2 m) deck and solid tongue for use with the J-5 and a small one with a 46½ inches by 20 inches (2.4 m by 0.6 m) deck and cable draft gear for use with the "Eliason" and Bombardier Alpine "Ski-doos."

Harold Serson has explained that these sleds were developed in response to the need for smaller field sledges that could carry discrete cargoes in a sled train on field expeditions. Typically a train would include a sled loaded with camping gear, another bearing oceanographic equipment, with two trailing sleds carrying fuel and food. The J-5 sleds were also designed to be easily dismantled for loading onto aircraft.[30]

Figure 13: J-5 sleds hitched behind "Eliason" motor toboggan at Tanquary Fiord, 4 May 1964. (Photo courtesy of Harold Serson).

U.S. Army Grader

The U.S. Army grader in the equipment line at Tanquary Fiord DRB camp was brought to Tanquary in 1964 for use in grading the airstrip for the camp (Figure 14). The manufacturer's plate indicates that it is a Corps of Engineers Airborne Equipment Grader with a gross weight of 1870 lbs. (850 kg), an 8.5-foot (2.9 m) blade, and lift of 8.5 inches (20 cm). The grader was manufactured by the J.D. Adams Manufacturing Company of Indianapolis, Indiana, with a patent date of 19 November 1942.

Boats

The four boats currently stowed on the beach at Tanquary Fiord were used during the Defence Research Board's program of research from this base camp from the 1960s to the present. These boats were recorded in an inventory of Tanquary equipment made in the fall of 1975,[31] and include two 14-foot (4.5 m) john boats, a 21-foot (7 m) canoe and an 8-foot (2.5 m) pram.

G. Hattersley-Smith reported that the 22-foot (7 m) freight canoe with an outboard motor was used for transportation to research sites on the fiord in the late summer of 1963 and for oceanographic work in the upper part of the fiord in calm weather and in ice-free conditions. This canoe was built with sponsons, or half-cylindrical enlargements of the gunwales down both sides to give it stability. The stern of the canoe was reinforced with aluminum tubes running diagonally from the transom to the gunwales. This same canoe is among the boats on the beach at Tanquary Fiord.[32]

A pram is a small, nearly flat-bottomed boat with broad transom and a squared bow. Its light weight, manoeuverability, and versatility made this boat style ideal for all-purpose use in the north.[33] The pram at Tanquary was used to extend the oceanographers' coverage of the area; it enabled the scientists to move from operations on the ice in the spring to carry out observations

Figure 14: U.S. Army grader at Tanquary Fiord, 1989 (HS, CPS, PNRO).

on the water after the ice melted.[34] Historical photographs of the research traverses of the Ward Hunt Ice Shelf in the 1960s show the pram mounted on a sled and towed by the John Deer 420 tractor based at the Ward Hunt Island camp (Figure 15).

John boats are narrow, flat-bottomed and square-ended boats often used on inland rivers and streams. In this case the "Prince Craft" john boats are of aluminium construction, with plywood reinforced transoms suitable for mounting outboard motors, such as the Evinrude motor stored in the Tanquary Wonder building. As with the canoes the john boats were used by Tanquary Fiord-based scientists as a means of transport on the fiord in the late summer.

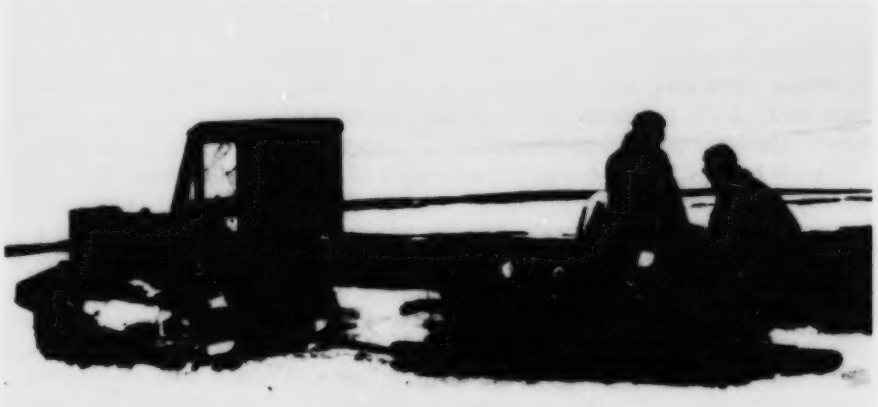

Figure 15: John Deere "Crawler" 420 tractor pulling J-5 sled and pram during circumnavigation of Ward Hunt Island, 1 July 1964. (Photo courtesy of Harold Serson).

Footwear for High Arctic Use

Rubber Boots

The development of appropriate footwear and, more generally, clothing for arctic operations was a priority for defence research programs in the United States and Canada from the Second World War era on.[35] There was an obvious need for warm, waterproof, and versatile footwear suitable for use in the highly variable weather and ground conditions of the High Arctic. The Defence Research Board specifically developed insulated rubber footwear for its northern Ellesmere Island activities, beginning in the 1950s. For example, when G. Hattersley-Smith made his initial reconaissance of the northern coast of the island in 1953 his party was supplied with rubber mukluks supplied by the Dominion Rubber Company to DRB specifications. Hattersley-Smith's assessment of the boots after the field season was that they had proved to be "ideal footwear on snow and ice with skis, snowshoes or crampons."[36] During Operation "Hazen" of 1957-59, DRB researchers employed both civilian and army insulated rubber boots with favourable results.[37]

Among the items recovered at Tanquary Fiord are a hip wader and a low rubber boot with canvas straps. Hip waders were used in the field when fording the region's many streams or on field work on the fiord during the melting season, as, for example, in a 1965 photograph of a scientist inspecting the rate of ablation of the fiord ice near Tanquary base camp.[38] The low rubber boot with straps was evidently an all-purpose boot whose rigid sole was ideal for use with a variety of winter travel equipment.

Snowshoes

Several pairs of snowshoes used during Operation "Tanquary" expeditions were recovered in the Wonder building. Snowshoes were considered ideal for travel in particular snow conditions, as on soft snow, and in climbing very steep hills. They were also well suited to work around a base camp and in pitching temporary camps in deep snow. Where they were less suitable than skis was in descending hills or for travelling long distances, unless the snow was very soft.

The snowshoes recovered at Tanquary are of the Huron type, an all-purpose design suitable for general use.[39] These snowshoes consisted of a netting stretched over a light wooden frame, with the frame ends tied parallel to one another to produce a rounded toe and pointed heel. An opening in the mesh behind the front cross-bar enabled the toe to descend below the surface of the snowshoe when the heel was raised in walking (Figure 16).

Cross-Country Skis

Three sets of cross-country skis from the 1960s, left behind by the DRB parties, have been set aside with the collection of artifacts recovered from the Wonder Building at Tanquary Fiord. Cross-country skis were used by the Department of National Defence in northern operations at least from the time of Operation "Muskox" and played a role in human transport in all DRB projects in northern Ellesmere Island (Figure 17).

Figure 16: Huron-type snowshoes at Tanquary Fiord, 1989 (HS, CPS, PNRO).

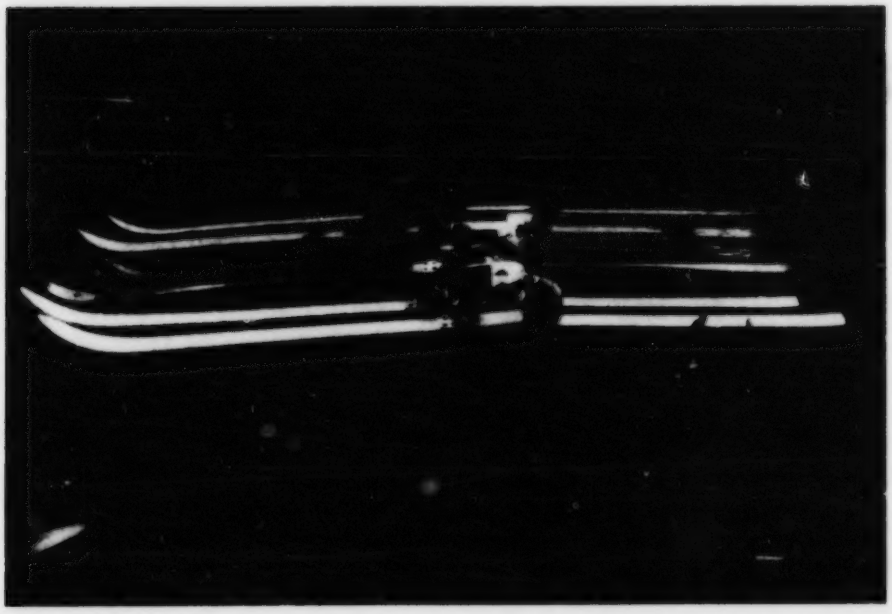

Figure 17: Cross-country skis and poles at Tanquary Fiord camp, 1989 (HS, CPS, PNRO).

Crampons

Crampons, sometimes called ice creepers, are detachable frameworks of metal spikes affixed to the bottom of boots to enable the wearer to walk securely on steep slopes and particularly on icy surfaces.

The modern crampon derives from a design developed by Oscar Eckenstein before the First World War.[40] His design was lighter than earlier crampon models, and increased the number, length, and sharpness of the spikes. Eckenstein also placed the spikes on the outside edges of the boot sole to provide the greatest security. These crampons were intended not only to afford greater security to climbers using ice steps but to eliminate the need to dig ice steps in particular circumstances. These features presumably were required by researchers working on the Gilman Glacier and adjacent ice cap in various research activities during Operations "Hazen" and "Tanquary." Crampons retrieved from the stock of artifacts at Tanquary Fiord are shown in Figure 18.

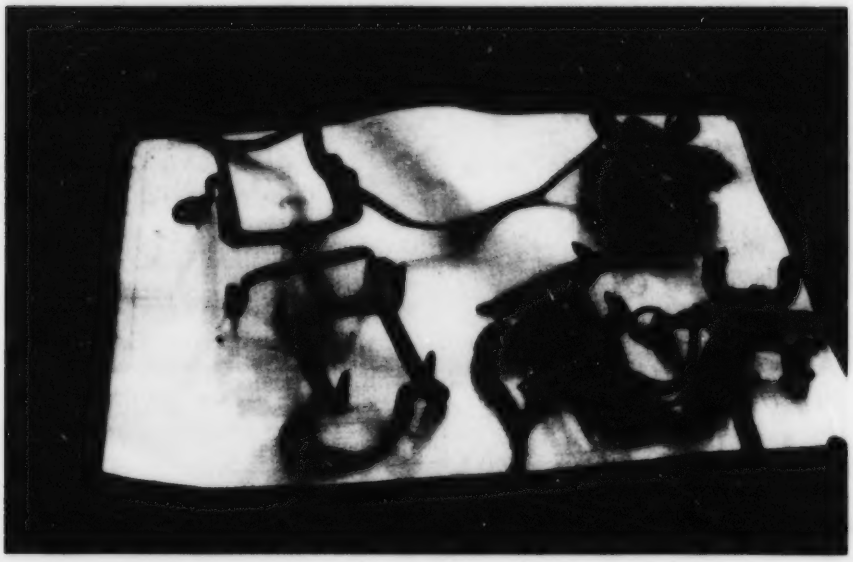

Figure 18: Crampons at Tanquary Fiord camp, 1989 (HS, CPS, PNRO).

Outfitting Artifacts and Trail Gear

Canadian Army Five-Person Bell Tent

These tents were used for extended shelter at Tanquary Fiord base camp, or at major field camps such as the one on the Gilman Glacier. During Operation "Hazen" four of these tents were used on the ice cap and needed to be repitched only once in four months. During the melt period they were anchored with ¾ inch (2 cm) bamboo poles drilled 18-24 inches (45-60 cm) into the ice.

Aluminum Foot Locker

An aluminum foot locker, stencilled with the sign "DEPT. OF NATIONAL DEFENCE - DEFENCE RESEARCH BOARD" and used in outfitting during Operation "Tanquary," is included among the artifacts set aside from the Wonder building at the base camp. It contains a number of camping items packed for a field trip, including a hand mixer, pots, utensils, paper towels, plastic bottle, and a roll of "Jubilee" toilet tissue (Figure 19).

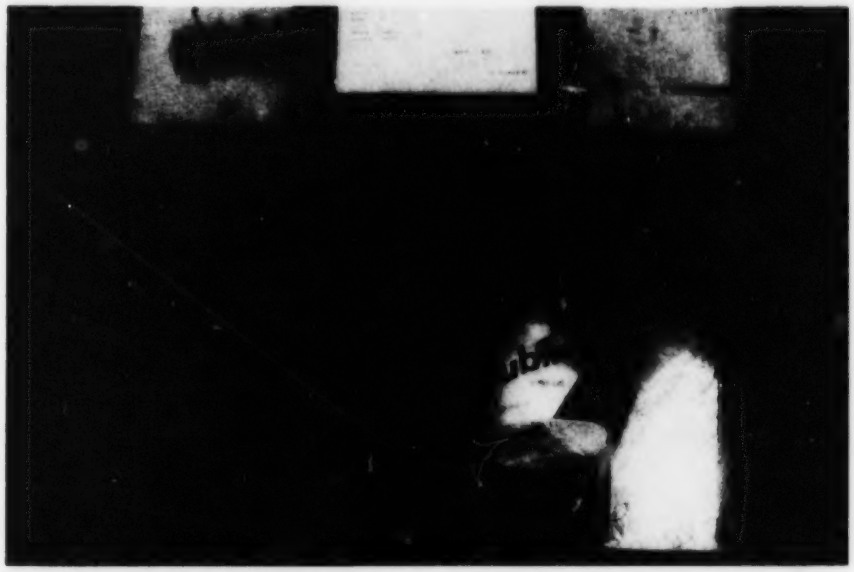

Figure 19: Aluminum foot locker and contents at Tanquary Fiord camp, 1989 (HS, CPS, PNRO).

Plywood Tent Seat

This collapsible seat consists simply of three small pieces of plywood fastened by two sets of metal hinges. It appears to be a home-made improvisation and representative of pragmatic adaptations in the field to the needs of outfitting (Figure 20).

Caribou Hides

A number of Barren Ground Caribou hides were found among the artifacts in the Tanquary Wonder Building. They were used as bedding mattresses by the field parties, much in the traditional manner of the Inuit, as they provided a good insulating layer for tenters in cold weather.

Packboards

Packboards were light-weight rigid frames used to lash together packed outfitting equipment such as tents, sleeping bags, and snowshoes so that they could be carried in a fixed bundle on the carrier's back. They served much the same function as today's outdoor packs, except that they lacked an attached sack and compartments. The frame placed against the wearer's back was fitted with two vertical straps to be placed around the wearer's shoulders.[41]

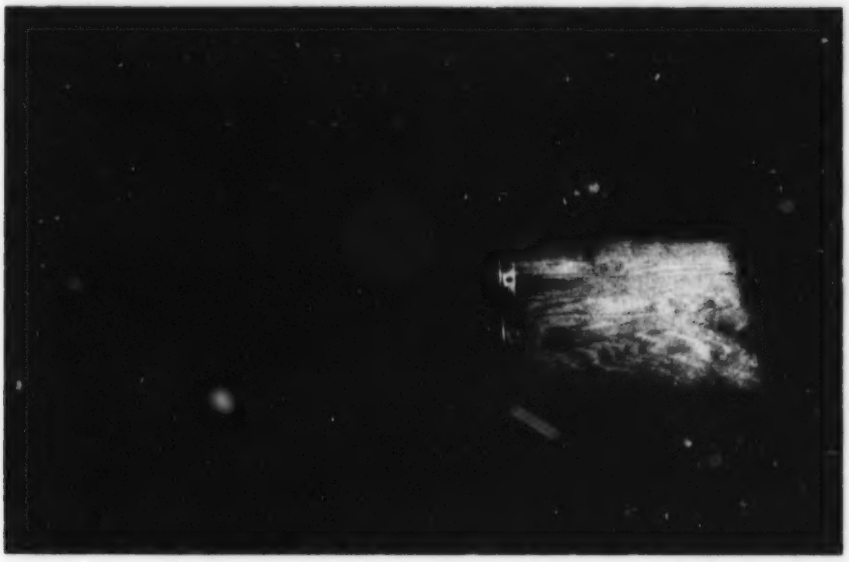

Figure 20: Plywood tent seat at Tanquary Fiord, 1989 (HS, CPS, PNRO).

The packboards found in the Wonder building at Tanquary Fiord are of two types. They include the "Yukon Packboard," consisting of a framework of two uprights held together by three cross pieces, around which a length of canvas is stretched and laced. Yukon packboards of both wooden and aluminium construction are represented. The other packboard is formed by a single piece of moulded metal, to which braided strips of canvas are stretched on the reverse side. Both types were tested by the American armed forces in Alaska in the 1940s[42] (Figure 21).

"Freeze-Dry" Foods

A large number of boxes of "Freeze-Dry" food tins are still housed in the Polar Continental Shelf side of the steel Wonder building at Tanquary Fiord (Figure 22). In addition to their continuing usefulness in supplementing the diets of scientists and government personnel at the site, these tins are considered to be historical artifacts in their own right. The Defence Research Board pioneered in sponsoring the research and development of these light weight foods as part of a more general focus on high arctic logistics.

Freeze Dry foods were ordered directly from Canada Freeze Dry Ltd., while all other foods were ordered from Peter Devine, an Ottawa grocer.[43] All shipments were checked and packed by the DRB. The manufacturer's blurb on the tins describes the process, as in the following example from the label of a tin of Freeze-Dried Mushrooms.

> *Freeze-Dried Mushrooms Are Made By a Revolutionary Process. They are Dried in a Vacuum While Frozen. Freeze Drying Removes Up to Ninety-Nine Percent of the Water, Yet Retains the Natural Flavour. Freeze-Dried Mushrooms Are Light Weight and Do Not Need Refrigeration.*

Figure 21: Packboards at Tanquary Fiord, 1989 (HS, CPS, PNRO).

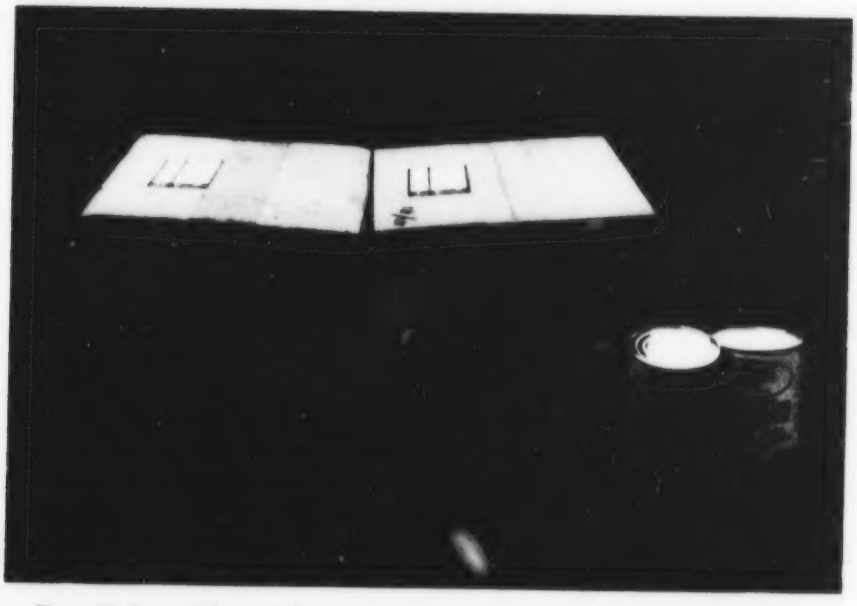

Figure 22: Boxes and tins of "Freeze-Dry Foods" at Tanquary Fiord, 1989 (HS, CPS, PNRO).

Artifacts Used in Ice Research

A number of items relating to Operation "Tanquary's" overriding research focus of sea-ice, and, to a lesser extent, land-ice studies, were identified among the Wonder building artifacts. These include two "ice screws" (Figure 23) and a snow coring kit (Figure 24), two ice chisels, a pick axe, a mattock, ice carrying tongs (Figure 25), ice auger, and a scoop shovel.

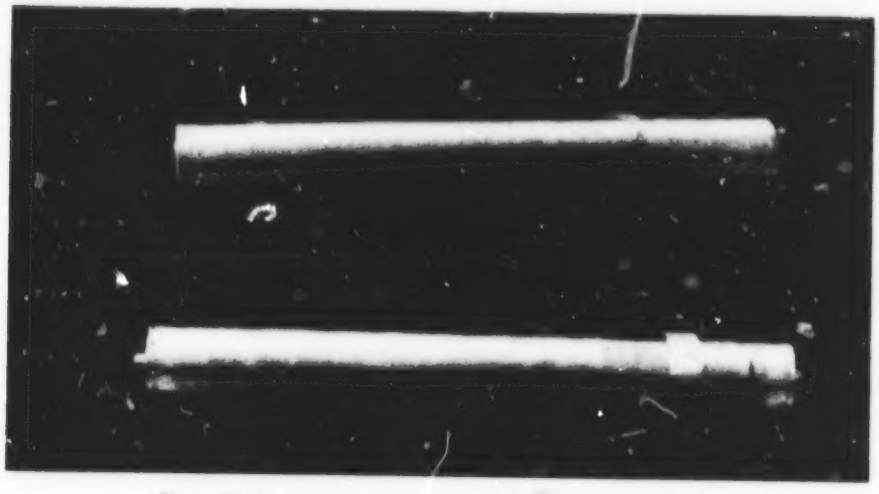

Figure 23: "Ice screws" at Tanquary Fiord, 1989 (HS, CPS, PNRO).

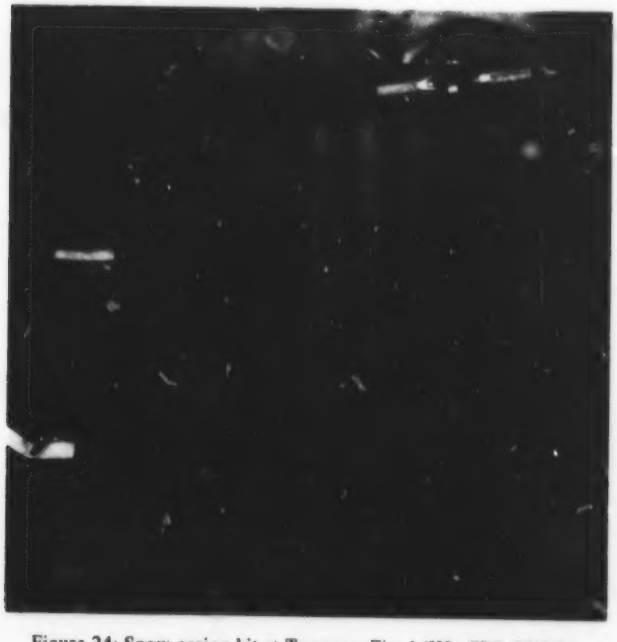

Figure 24: Snow coring kit at Tanquary Fiord (HS, CPS, PNRO).

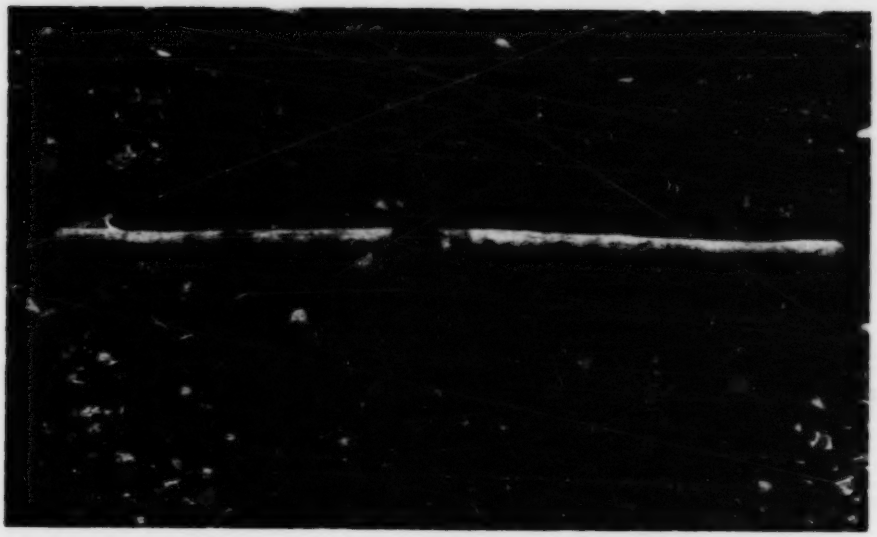

Figure 25: Ice carrier tongs at Tanquary Fiord, 1989 (HS, CPS, PNRO).

Fuel Drum Raft

A raft supported by eight empty fuel drums is currently beached near the repair shop at Tanquary Fiord. It consists of a 16 foot by 4 foot (5 m by 1.3 m) plywood platform nailed to four joists, lashed in turn to eight fuel drums. A 1967 photograph shows the raft anchored in the fiord near the Tanquary base camp, and with a winch, stand and salinometer set up on the deck (Figure 26).

Figure 26: Fuel drum raft at Tanquary Fiord, 1967. (Photo courtesy of Harold Serson).

WARD HUNT ISLAND DRB CAMP

In 1946 the U.S. Air Force discovered a huge floating ice island less than 300 miles (480 km) north of Point Barrow, Alaska. By 1950 three other ice islands had been found and in 1952 the Air Force established a weather station on the island T-3 in the Arctic Ocean. With the concurrent discovery of a series of ice shelves, or floating ice rafts frozen to the northern coast of Ellesmere Island, scientists deduced that the ice islands had calved from these shelves. In consequence the ice shelves themselves attracted the considerable interest of both American and Canadian scientists. In the 1950s both countries initiated a series of research programs focusing on the largest of the Ellesmere ice shelves, the Ward Hunt Island Ice Shelf. This shelf then stretched nearly 50 miles (80 km) from west to east and up to 20 miles (30 km) north from the mouth of Disraeli Fiord and surrounding the small island from which the shelf takes its name.

The Ward Hunt Island research camp was established in 1959 as a result of a co-operative initiative by the Terrestrial Sciences Laboratory of the Cambridge Research Centre of the United States Air Force, the Arctic Institute of North America and the Canadian Defence Research Board (DRB). Other participating research agencies were the United States Army Quartermaster Corps, the United States Naval Engineering Laboratory, and the Hydrology Branch of the United States Geological Survey.[44] The project followed earlier studies by G. Hattersley-Smith of the DRB, A.P. Crary of the U.S. Air Force, and others between 1953 and 1958.

The 1959 expedition's primary purpose was to investigate conditions normally obtaining on the Ward Hunt Island Ice Shelf to determine its suitability as a landing surface for aircraft. More generally the expedition related to the post-Second World War preoccupation of United States and Canadian military planners with developing logistical capability for military operations in the High Arctic. To this end, scientific research was carried out in meteorology, surface hydrology, thermal structure, ablation, and the topography of the ice shelf. Much of the early scientific work involved the taking of ice cores to enable their subsequent study, in laboratory conditions, to establish the structural and stratigraphic history of the shelf.

Supply operations for the project began between the 16 and 19 May, when nine men and 50 tons of supplies were airlifted from Thule Greenland, to the ice shelf. The aircraft used on the operation was a ski-wheeled C-130 of the Air Force Cambridge Research Centre, which made five supply landings on the ice shelf about 1 mile (2 km) north of Ward Hunt Island. Re-supply flights were again made in September and when the expedition personnel were evacuated in November.

The expedition members established its principal meteorological station on the northern edge of the ice rise fixed to Ward Hunt Island, about 4 miles (6.5 km) north of the camp. To obviate the difficulties of operating on the ice shelf during the melting season, a base camp was established on the northern end of the island. Initially it was said to consist of two Jamesway shelters, various tents, caches for food, fuel and lumber, and gravel airstrip.[45]

In 1960 the participating agencies again sent personnel to continue the studies under the rubric of the Ellesmere Island Ice Shelf Project. Twenty-three people were involved in the fieldwork although only seven of these were on the ice shelf for the entire field season of 26 April to 24 September. It was presumably at this time that the remaining structures were assembled at the Ward Hunt Island camp, including the two Attwell shelters that remain on the site.[46]

When in 1963 Harold Serson of the Defence Research Board compiled an inventory of the buildings and major pieces of equipment at Ward Hunt Island, he identified eight structures: two Attwell shelters, one used as an office and the other as a cook house; two Jamesway shelters, used as a garage and a sleeping hut, respectively; and four smaller structures including two outhouses, a generator hut and a stores tent.[47] All of these structures appeared to be extant when the camp was inspected by Canadian Parks Service researchers in July 1989.

By the 1960s research at Ward Hunt Island was expanded to encompass the study of shelf ice movements. Between August 1961 and April 1962 a considerable proportion of the ice shelf

broke up to form five new ice islands. One of the segments drifted east to block the mouth of the Robeson Channel, preventing polar pack ice from moving through the Nares Strait. Accordingly, research was directed toward measuring the extent of internal distortion, movement and stresses on the ice shelf proper.[48]

Subsequently the camp was periodically occupied during the summer field seasons by DRB scientists based at Tanquary Fiord. Ice core samples continued to be a focus of activity. The stratigraphic layers, representing periods of net accumulation and ablation have been used with carbon-dated driftwood and other data to reconstruct profiles of the climatic history of the region.

Shelters

The framework of two Jamesway shelters used during the 1959-60 expedition to establish the Ward Hunt Island camp, remain *in situ* and in fairly good condition. One of the shelters is uncovered, its cover having been removed in 1985 to "double" the insulating blankets on the kitchen and office huts. However, the uprights are still in acceptable condition and could support a cover replacement (Figure 27). The other Jamesway shelter functioned as the expedition's garage; it, too, requires the replacement of its cover. The camp's two Attwell shelters are similarly well preserved, apart from the loss of parts of their insulated covers.

Figure 27: Frame of Jamesway shelter, Ward Hunt DRB camp, 1989 (HS, CPS, PNRO).

John Deere Tractor

A John Deere 420 "Crawler" tractor and grading attachment are among the equipment artifacts sitting out in the open at the Ward Hunt Island camp. They are apparently in good condition. The tractor was used to clear snow around the camp, and in grading and maintaining the runway. In 1964 and 1965 it was used to pull the survey equipment for DRB studies into ice shelf movements.[49] (Figure 15).

Tucker "Sno-Kitten"

A Tucker "Sno-Kitten," a half-track vehicle designed for arctic use, is currently housed in the Jamesway shelter formerly used as a garage at the Ward Hunt Island camp. The term "half-track" implies tracks for load support and traction, and wheels or skis for steering. The "Sno-Kitten" is essentially one-half of a "Sno-Cat"; it has two pontoons and is skid-steered, contrasting with the four-pontoon Sno-Cat. Manufactured by the Tucker Sno-Cat Corporation of Medford, Oregon, these vehicles, or the larger Sno-Cats from which they were developed, were used after the Second World War to transport personnel and equipment over long distances in the High Arctic or Antarctic. In 1947 the Canadian Department of Energy, Mines, and Resources obtained a Sno-Cat that was tested in trials in British Columbia from December 1947 to May 1948.[50] In 1959 and 1960 research teams supported by the U.S. Air Force used Sno-Cats in ice shelf studies both in the North American Arctic and in Antarctica.[51] The "Sno-Kitten" at Ward Hunt Island apparently was brought to the camp in 1959 or 1960; it was there when Harold Serson of the DRB took inventory of the camp equipment in 1963.[52]

"Weasel" frame

The frame of an amphibious "Weasel" (Light Cargo Carrier 1929 C, manufactured by the Studebaker Corporation) is found among the artifacts at the Ward Hunt Island camp. The frame earlier sat on twin caterpillar tracks and was presumably off-loaded by the military supply planes used to land men and equipment on the ice shelf in 1959 or 1960.

"Weasels" were used by a number of arctic and antarctic expeditions in the late 1940s and 1950s. They were quite powerful carriers for their size and considered capable of holding between 440 and 1320 lbs. (200 and 600 kg) each, while pulling from 5500 to 6600 lbs. (2500 to 3000 kg) on a sledge behind.[53] They were also highly versatile vehicles, capable of wading, floating, and crossing snow or swamp.[54]

"C" (Combat) Rations

A number of cardboard boxes of "C" Rations or dehydrated tinned goods developed by the U.S. military for provisions in combat situations, remain in and around the former kitchen shelter at Ward Hunt Island. While many of the tins are rusting, some of the "C" rations are in good condition and still edible. They are considered worthwhile artifacts, valuable for illustrating the logistics of mounting scientific research operations in this extremely remote location (Figure 28).

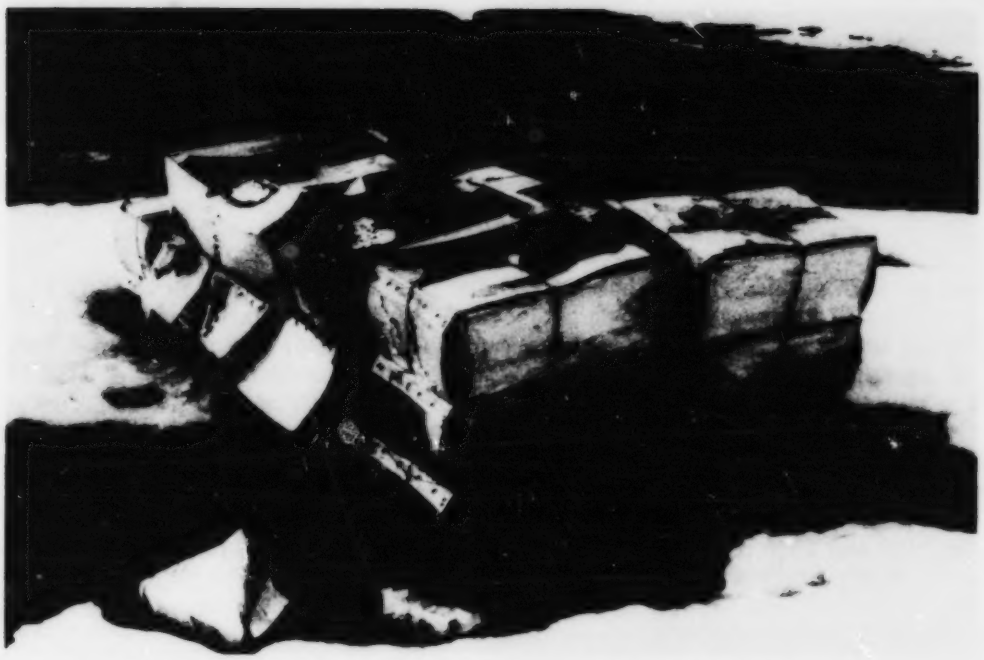

Figure 28: Boxes of U.S. Army Air Force "C" Rations, Ward Hunt Island DRB camp, 1989

CONCLUSIONS

The assorted shelters and artifacts of the three Defence Research Board base camps in northern Ellesmere Island comprise a comprehensive collection of cultural resources illustrating a range of historical themes associated with the DRB's activities in the region from the 1950s to the 1970s. They are identified with the largest scientific research undertaking in the history of the Canadian High Arctic, in terms of scale of operations, comprehensiveness, and duration. Beyond the scientific associations the resources are associated with a number of important by-products of the research activity, including the development within the DRB of a sophisticated understanding of the techniques of logistics, transportation, and outfitting in the rugged climatic and terrain conditions of the High Arctic. The experience of co-ordinating large-scale expeditions to northern Ellesmere provided valuable knowledge for subsequent research parties and for military planners concerned with the logistics of mounting operations in this most remote region of Canada's Arctic. Moreover, the artifacts themselves tell an interesting story of pragmatic adaptation to work and life in the High Arctic. For example, the use of such items as caribou hides for tent bedding, Greenland-type komatiks in sledging, and the development of modern fuel drum sledges patterned after Baffin Island komatik prototypes showed the influence of Inuit material culture in the outfitting of field parties during the DRB tenure in northern Ellesmere Island. Similarly, the use of empty fuel drums in the construction of an instrument raft at Tanquary Fiord and a food cache at the Lake Hazen camp represented a pragmatic reuse of the available materials, a necessary approach given the difficulty and expense of transporting materials to such remote locations. Other resources, such as the "Freeze-Dry" foods, represented DRB initiatives in the development of foodstuffs appropriate to the supply and outfitting of parties in such remote locations. The use of imported technology, too, as represented in the light-

weight shelters and early snowmobiles, helped to shape subsequent approaches to shelter, transportation, and logistics in the region. This work has continued under the stewardship of the Polar Continental Shelf Project, which assumed the management of the Tanquary Fiord base camp in 1978.

Collectively, the historical resources at the three camps chart the development of Canada's technological capacity to carry out large-scale operations in the High Arctic. They provide an important historical record, not only of the Defence Research Board's contribution to the logistics of High Arctic science, but, indeed, to the development of the science of logistics.

APPENDIX: INVENTORY OF ARTIFACTS AT TANQUARY FIORD CAMP CONSIDERED OF POSSIBLE HISTORICAL INTEREST

I. Artifacts in the steel Wonder Building (quonset) at Tanquary

	ITEMS	HISTORICAL THEME
1.	Bombardier "Ski-doo" parts (S.E. corner)	Transportation
2.	Crate containing Strapping Machine	Logistics
3.	Oxygen Analysis Lab (white cabinet of lab supplies)	Scientific Research
4.	Pail of Parcoll parts	Logistics
5.	Crate of glass sample bottles	Scientific Research
6.	3 sets cross-country skis (with bindings)	Transportation
7.	Climbing or safety belts w/accessories	Transportation
8.	Rope (hemp)	Transportation
9.	Spring balance (scales)	Logistics/Scientific
10.	2 metal & canvas packboard frames	Outfitting
11.	3 wood & canvas packboard frames	Outfitting
12.	Signal Corps radio transmitter/Signal Lamp [Part of SCR-578-B] & case	Logistics
13.	Signal Corps hydrogen generator (Can) (both nos. 13 and 14 were part of a "Gibson Girl emergency transmitter set, the balloon and hydrogen used to raise an antenna from a life raft)	Logistics
14.	2 Signal Corps weather balloons (Can)	Logistics
15.	Spool of alpha wire	Logistics
16.	Antennae kit (on spool)	Scientific Research/ Logistics
17.	Regulator for air cylinder	Logistics
18.	Aluminium & nylon packboard frame (Serson) 2 Strips (Trima-Skifell)	Outfitting
19.	Skin for skis (for traction)	Transportation
20.	Case of botanical equipment (DRB)	Scientific Research
21.	Hip wader	Outfitting
22.	Low rubber boot w/canvas straps	Outfitting
23.	Immersion heater (industrial)	Scientific Research
24.	Ice creepers or crampons	Transportation
25.	Fibre case w/metal reinforced edges	Logistics
26.	Mattock	Logistics
27.	Pick axe	Logistics
28.	Thermos liner (vacuum bottle)	Scientific Research
29.	Ice chisel (wooden handle)	Logistics
30.	Scoop shovel	Logistics
31.	2 "Ice screws," used as ice anchors	Scientific
32.	Set skis with bindings	Transportation
33.	1 set ski poles - bamboo	Transportation
34.	1 set ski poles - aluminium	Transportation
35.	1 set ski poles, copper coloured aluminium	Transportation
36.	1 broken, taped bamboo ski pole	Transportation
37.	2 pairs ice creepers	Transportation

38.	Aluminium foot locker, DRB	Outfitting
39.	2 pairs snow shoes w/snowshoe harness	Transportation
40.	2 Barren Ground Caribou hides	Outfitting
41.	5-man bell tent	Outfitting
42.	Visor from plastic snow goggles	Outfitting
43.	Lead weight	Scientific Research
44.	6-seat life raft in orange bag	Logistics
45.	Day pack	Outfitting
46.	Home-made plywood tent seat	Outfitting
47.	Plywood snow anchors for tents	Outfitting
48.	Evinrude outboard motor	Transportation
49.	Evinrude gas can	Transportation
50.	Snow coring kit (steel tubes in canvas case)	Scientific Research
51.	Ice chisel (metal handle)	Logistics
52.	"Freeze-Dry Foods" boxes Outfitting	
53.	Bearded Seal dog traces	Transportation
54.	Grasshopper dog harness (Als KK & G) (made in Norway)	Transportation
55.	Ice carrier (tongs on a handle for 2 men to carry)	Scientific Research
56.	Ice auger	Scientific Research
57.	American Army reusable steel small drums	Outfitting

II. Artifacts in the Equipment Line at Tanquary

	ITEM	HISTORICAL THEME
1.	Bombardier "Ski-doo" (incomplete)	Transportation
2.	Bombardier "Ski-doo" (incomplete)	Transportation
3.	U.S. Army Corps of Engineers grader	Logistics
4.	Greenland sled (komatik)	Transportation
5.	Greenland sled (komatik)	Transportation
6.	"Nansen" sled	Transportation
7.	"Nansen" sled	Transportation
8.	"Nansen"-type Grasshopper sled	Transportation
9.	J-5 sled	Transportation
10.	J-5 sled	Transportation
11.	Sled of undetermined design	Transportation
12.	Instrument shelter	Scientific Research

Endnotes

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